BENEFICIAL USE OF ILLINOIS RIVER SEDIMENT

FOR RESTORATION OF DEGRADED SITES

John C. Marlin

Waste Management and Research Center

Illinois Department of Natural Resources

Tampa, FL January, 2008

Fresh Water Bodies are losing about 1 % of their capacity annually to sedimentation.

Sediment removal will be increasingly important as means of addressing this issue.

Much sediment can be viewed as a resource out of place and may be useful if returned to the land.

Many areas near waterways and water bodies need soil for remediation and restoration.

There is an urgent need for better soil management as current construction methods coupled with erosion are rapidly degrading soil profiles in the U. S.

Clean sediment can help

Beneficial Use as Soil can

Restore economic and ecological values in aquatic systems

Provide soil for restoration and remediation

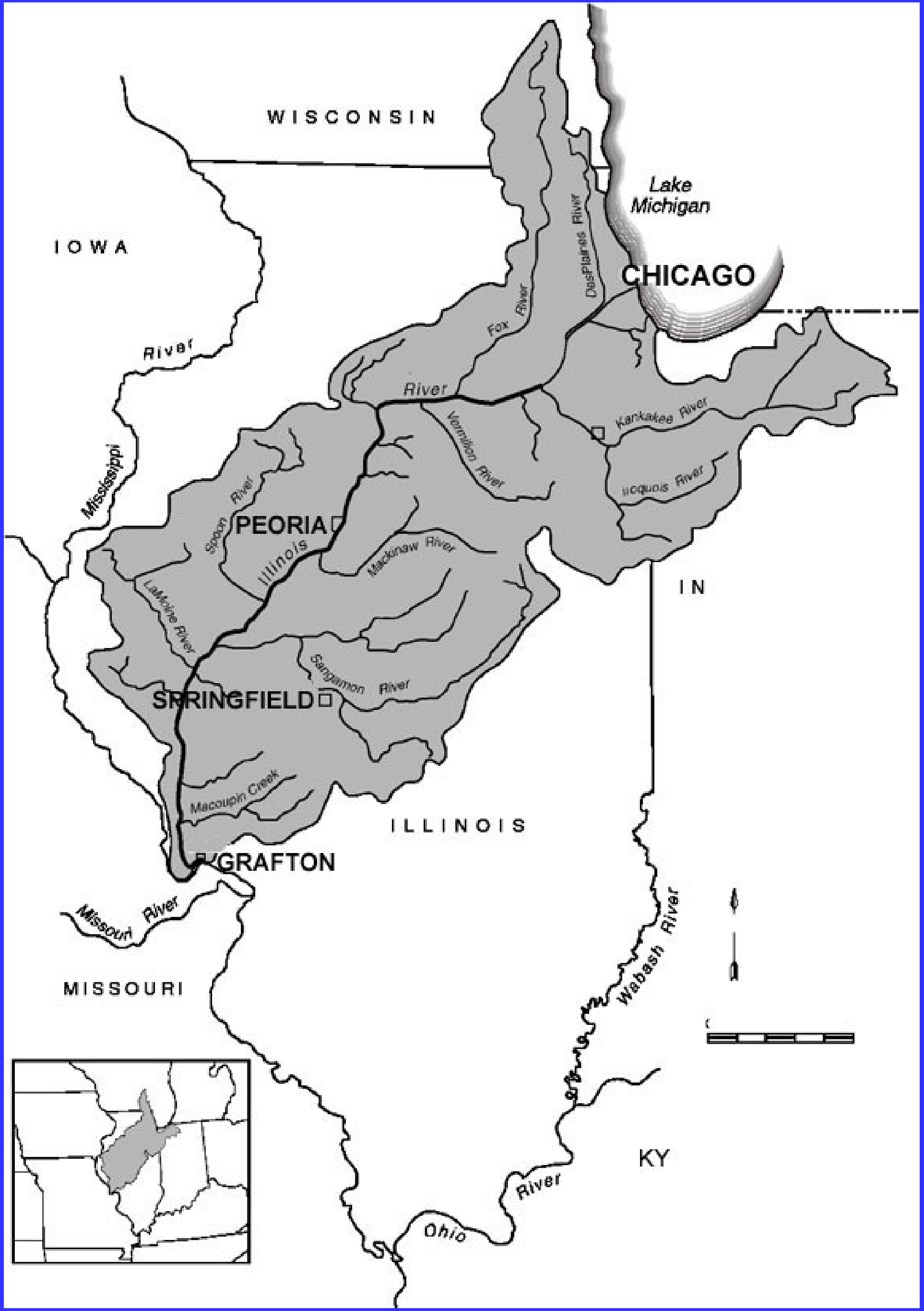
Reduce truck traffic in urban areas

Reduce the need for taking

Potential Uses for Large Quantities of Sediment

- Landscaping soil
- Strip mine reclamation
- Brownfield cover
- Construction fill
- Islands or other habitat

Illinois River System Major Alterations:


WISCONSIN
IOWA
Lake Michigan
CHICAGO
DesPlaines River
Fox River
River
Mississippi
River
Kankakee River
Vermilion River
Iroquois River
PEORIA
Spoon River
Illinois
Mackinaw River
LaMoine River
Sangamon River
SPRINGFIELD
Macoupin Creek
GRAFTON
ILLINOIS
IN
Missouri River
MISSOURI
Wabash River
KY
Ohio River

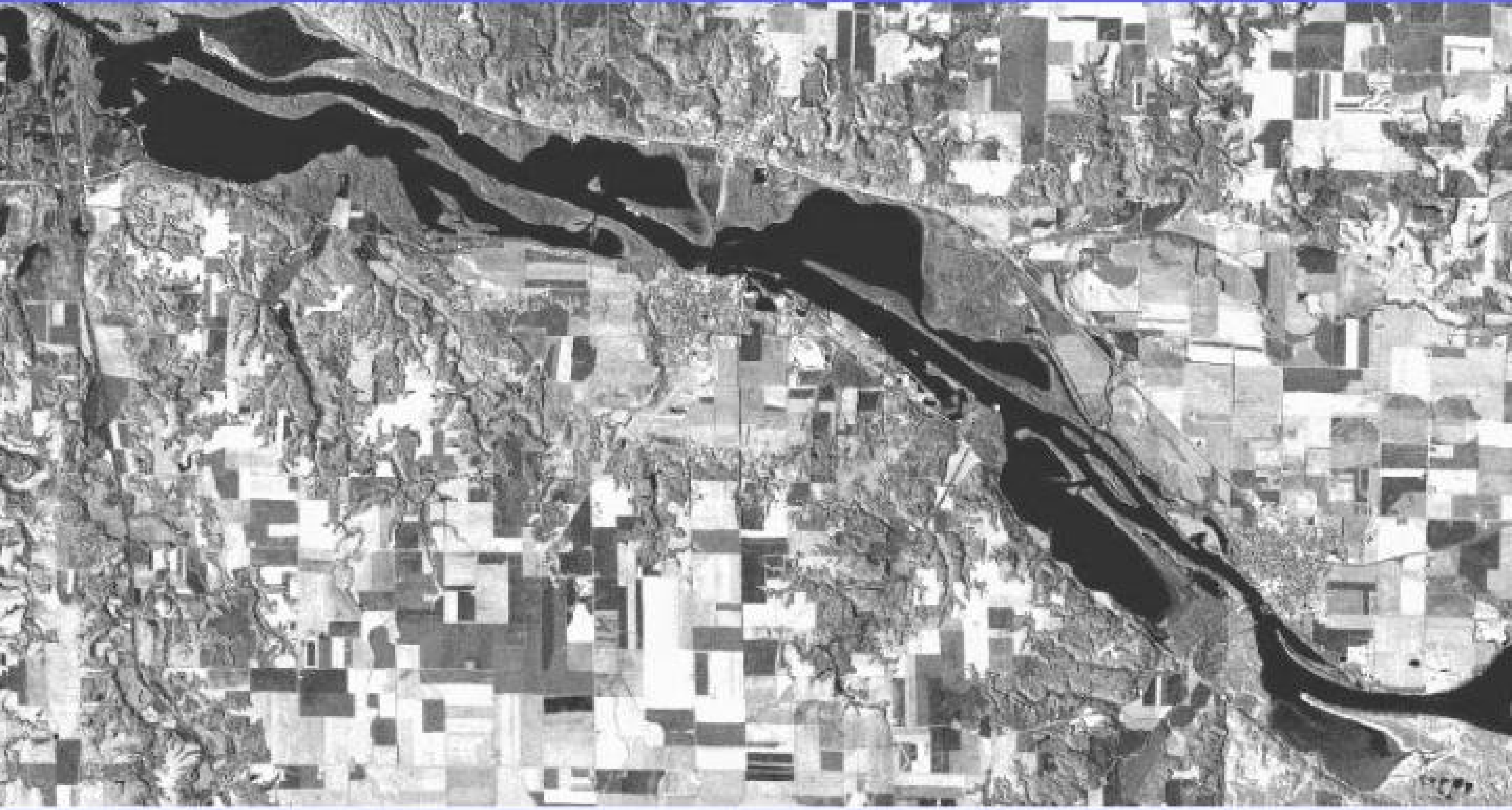
Connection to Lake Michiga
In 1900

Locks and dams since late 1

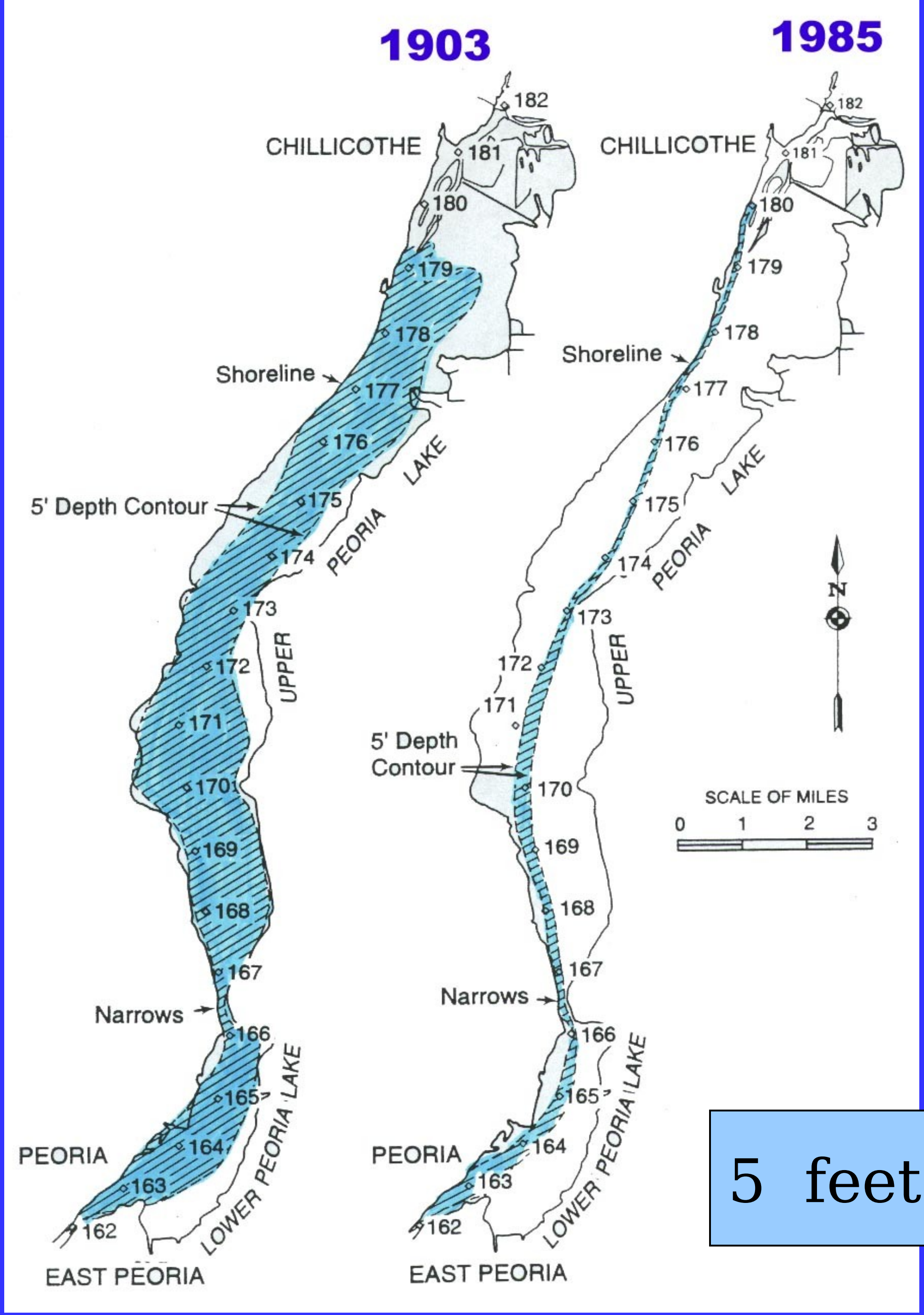
Levees isolate half of floodp

Intensive agriculture, row c

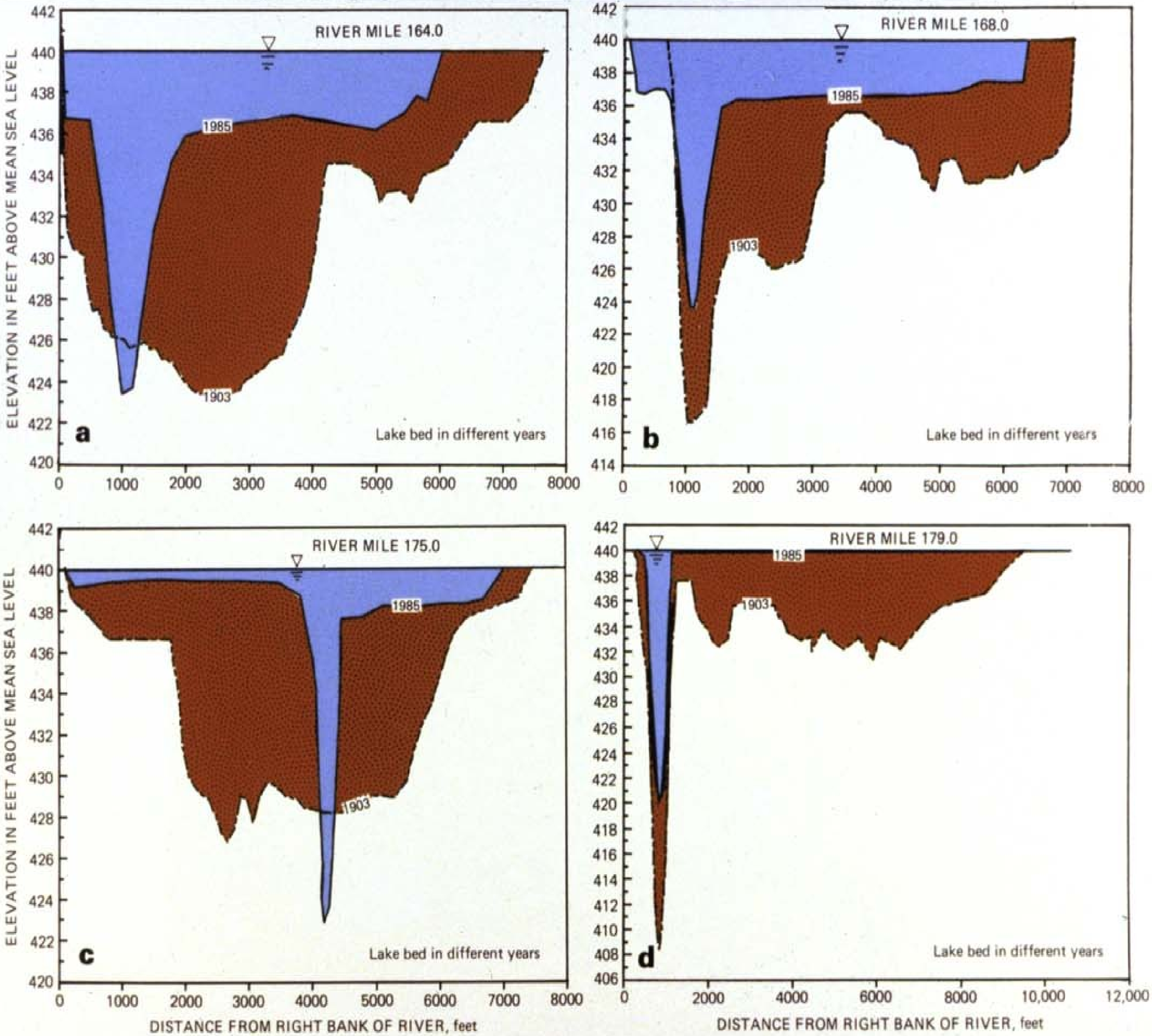
Urbanization and runoff



Illinois River Backwaters between Chillicothe and Henry, Ill.


1903
1985
CHILLICOTHE
182
181
180
179
178
177
176
175
174
173
172
171
170
169
168
167
166
165
164
163
162
Shoreline
5' Depth Contour
PEORIA LAKE
UPPER
Narrows
PEORIA
LOWER PEORIA LAKE
EAST PEORIA
CHILLICOTHE
Shoreline
5' Depth Contour
N
SCALE OF MILES
0
1
2
3

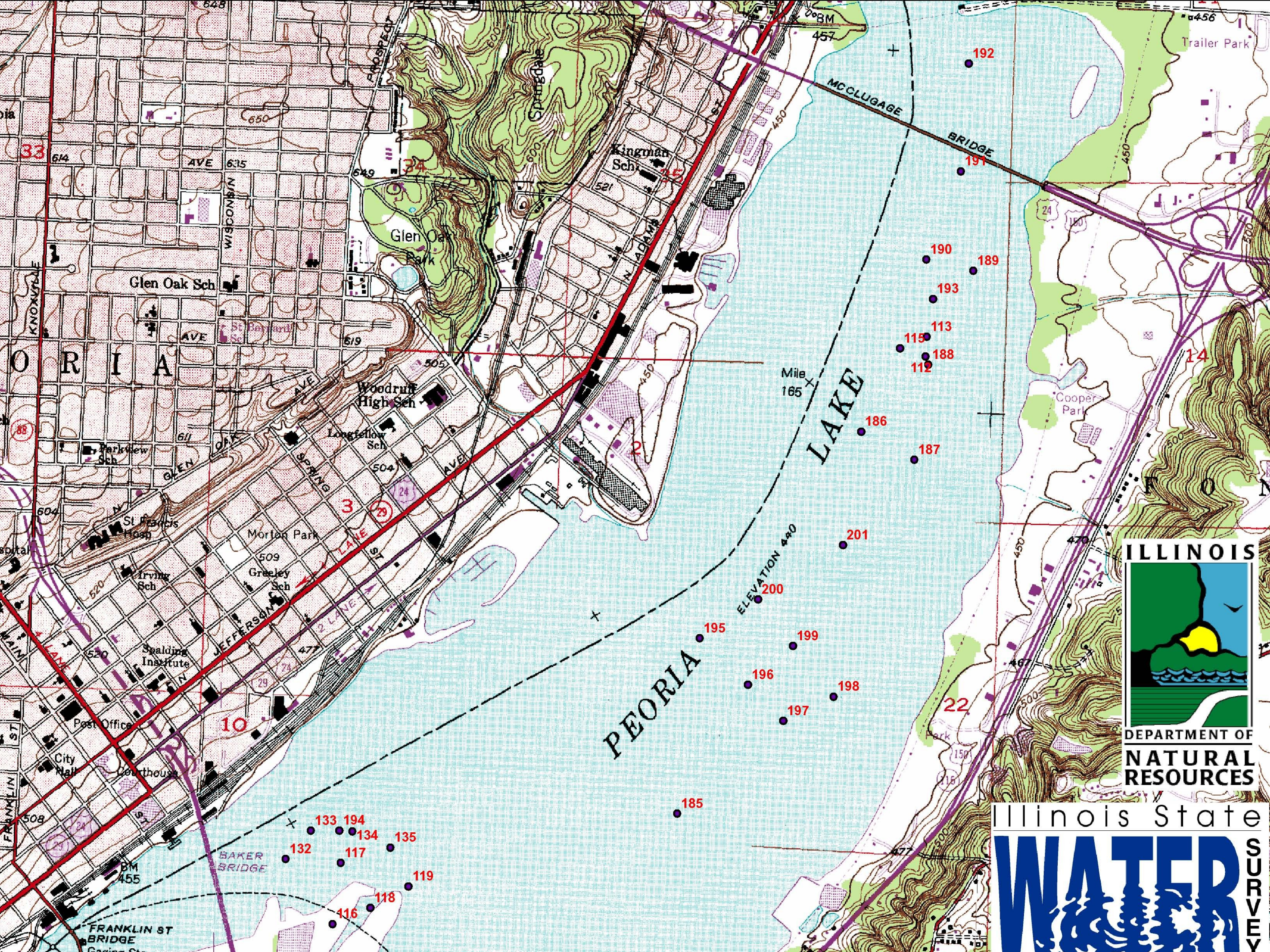
5 feet or more deep


RIVER MILE 164.0
1985
1903
a
Lake bed in different years
RIVER MILE 168.0
1985
1903
b
Lake bed in different years
RIVER MILE 175.0
1985
1903
c
Lake bed in different years
RIVER MILE 179.0
1985
1903
d
Lake bed in different years
ELEVATION IN FEET ABOVE MEAN SEA LEVEL
DISTANCE FROM RIGHT BANK OF RIVER, feet
442
440
438
436
434
432
430
428
426
424
422
420
418
416
414
412
410
408
406
0
1000
2000
3000
4000
5000
6000
7000
8000
10,000
12,000

DREDGE SPOIL ???

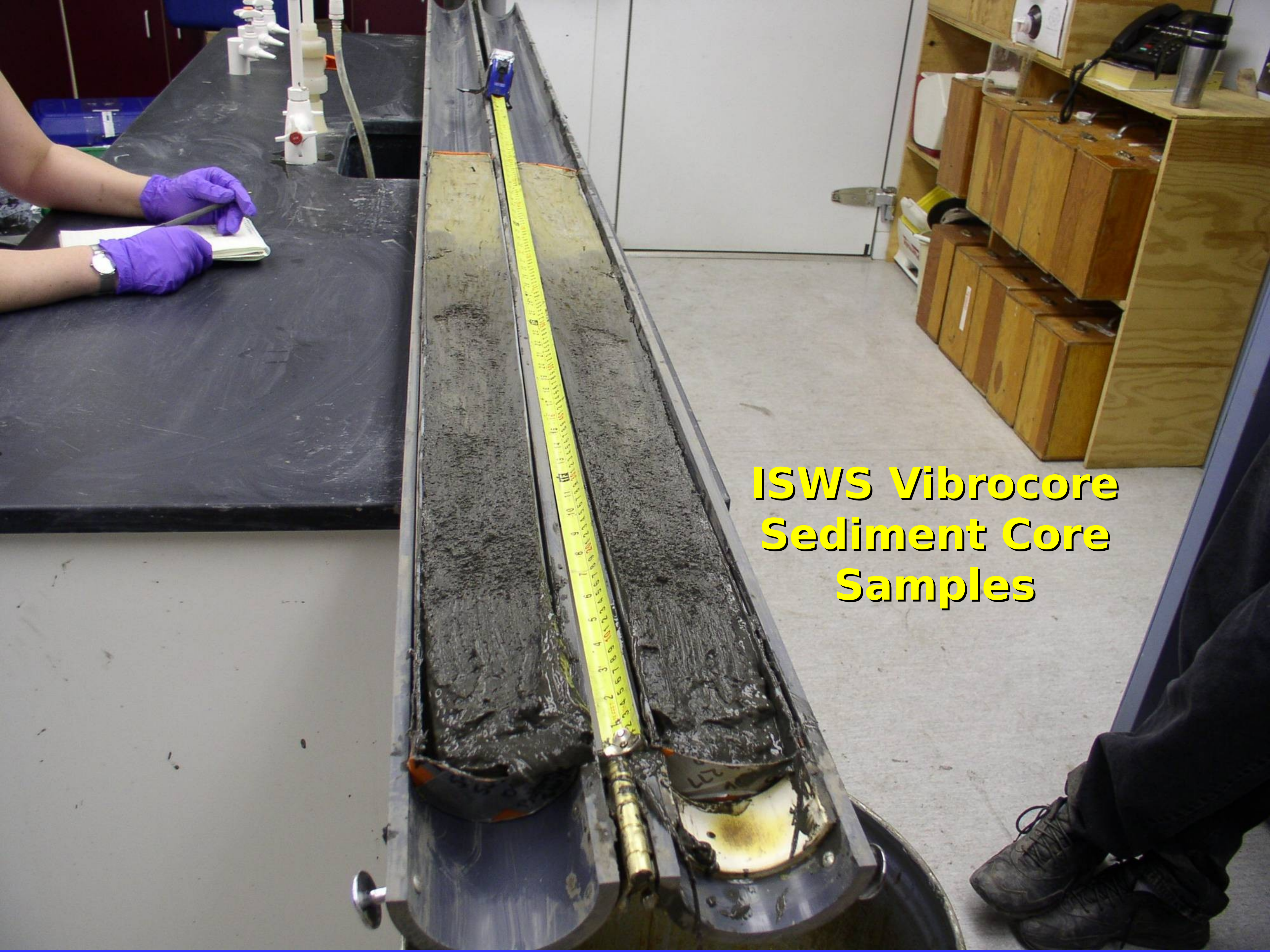
- Take the O out of
  SPOIL
  and you have SPIL
  ---D. Thomas, PhD.

- Take the P out of SPOIL
  and you have SOIL
  ---C. Lee, PhD.


192
191
190
189
193
113
115
188
112
186
187
201
200
195
199
196
198
197
185
133
194
134
135
132
117
119
118
116
PEORIA LAKE
ELEVATION 440
Mile 165
MCCLUGAGE BRIDGE
BAKER BRIDGE
FRANKLIN ST BRIDGE
Glen Oak Park
Glen Oak Sch
Kingman Sch
Woodruff High Sch
Longfellow Sch
Morton Park
Greeley Sch
Irving Sch
St Francis Hosp
Spalding Institute
Post Office
City Hall
Courthouse
Cooper Park
Trailer Park
Springdale
P E O R I A
F O N
BM 457
BM 455

ILLINOIS
DEPARTMENT OF
NATURAL
RESOURCES

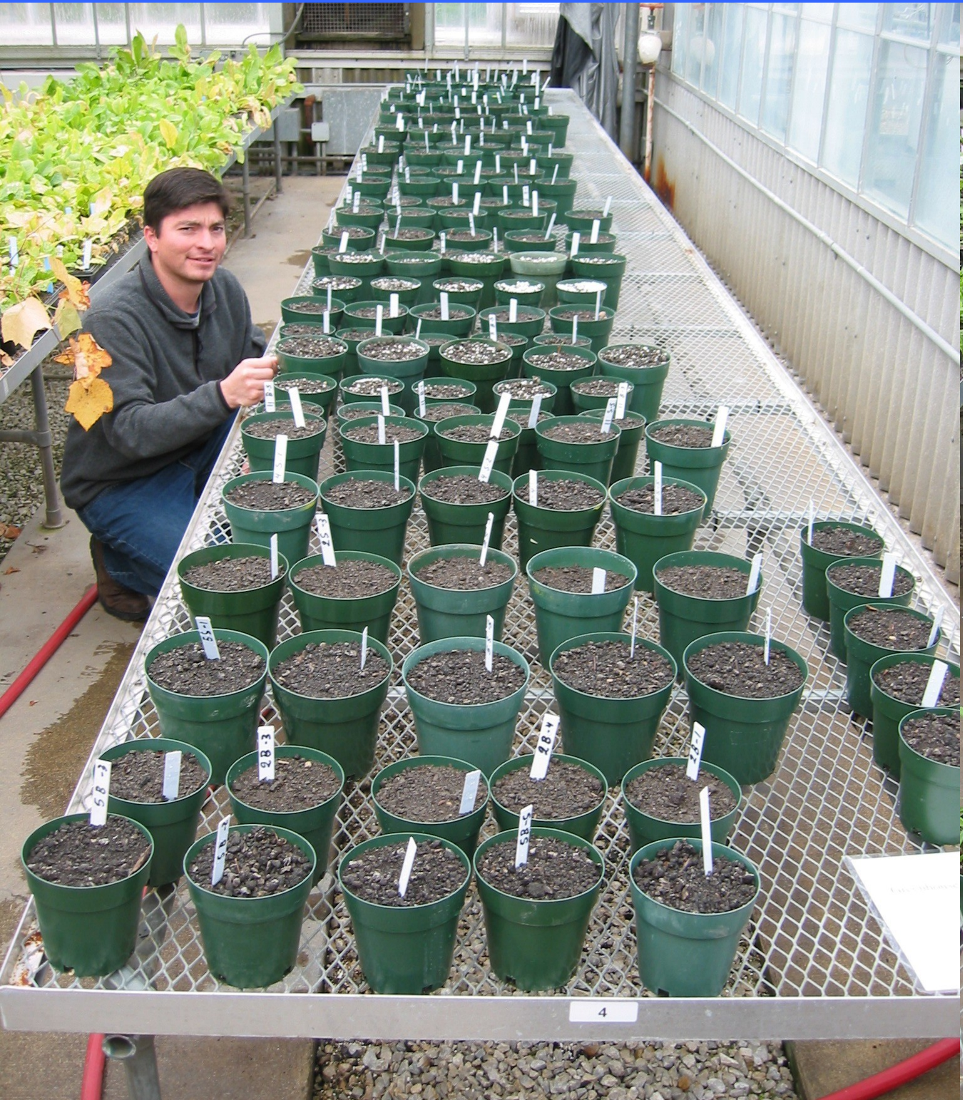
Illinois State
WATER
SURVEY



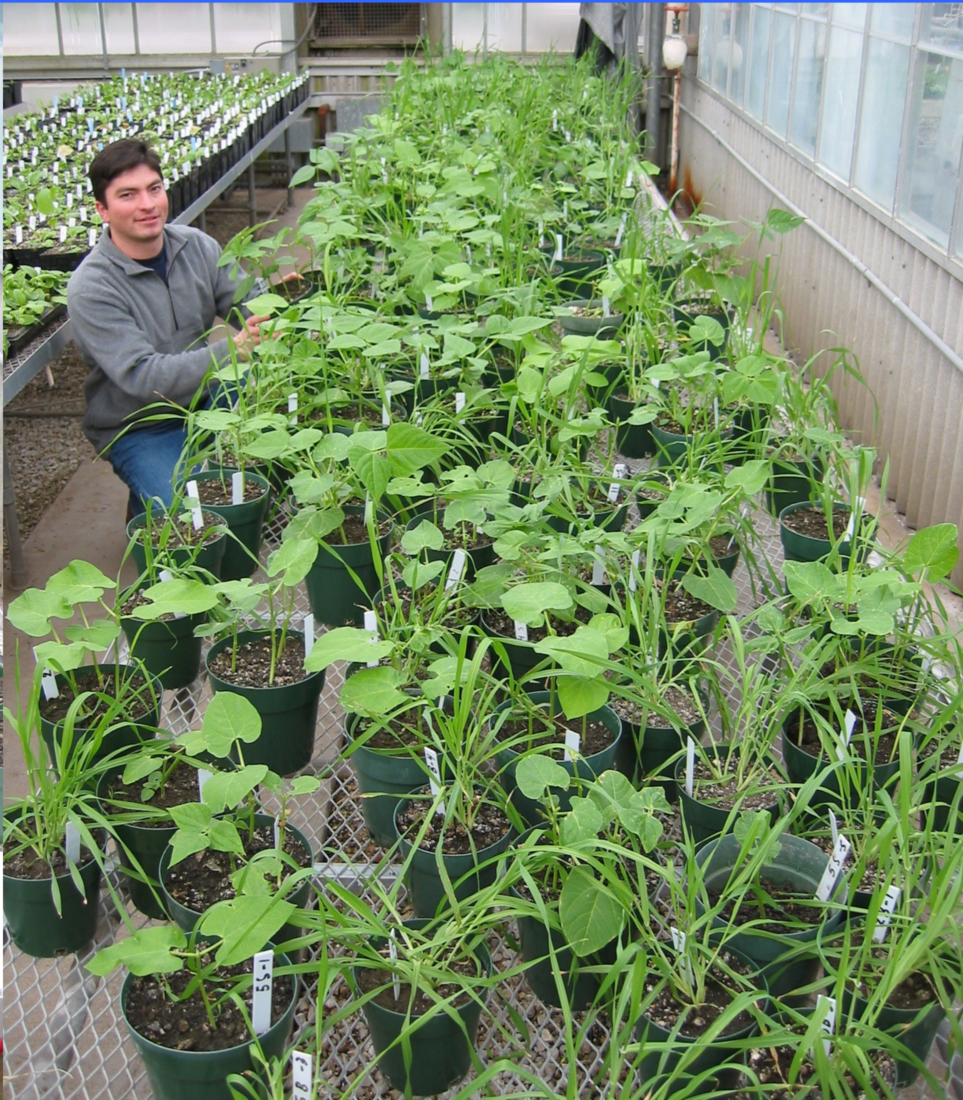
ISWS Vibrocore Sediment Core Samples

Greenhouse Experiment II

Start of experiment

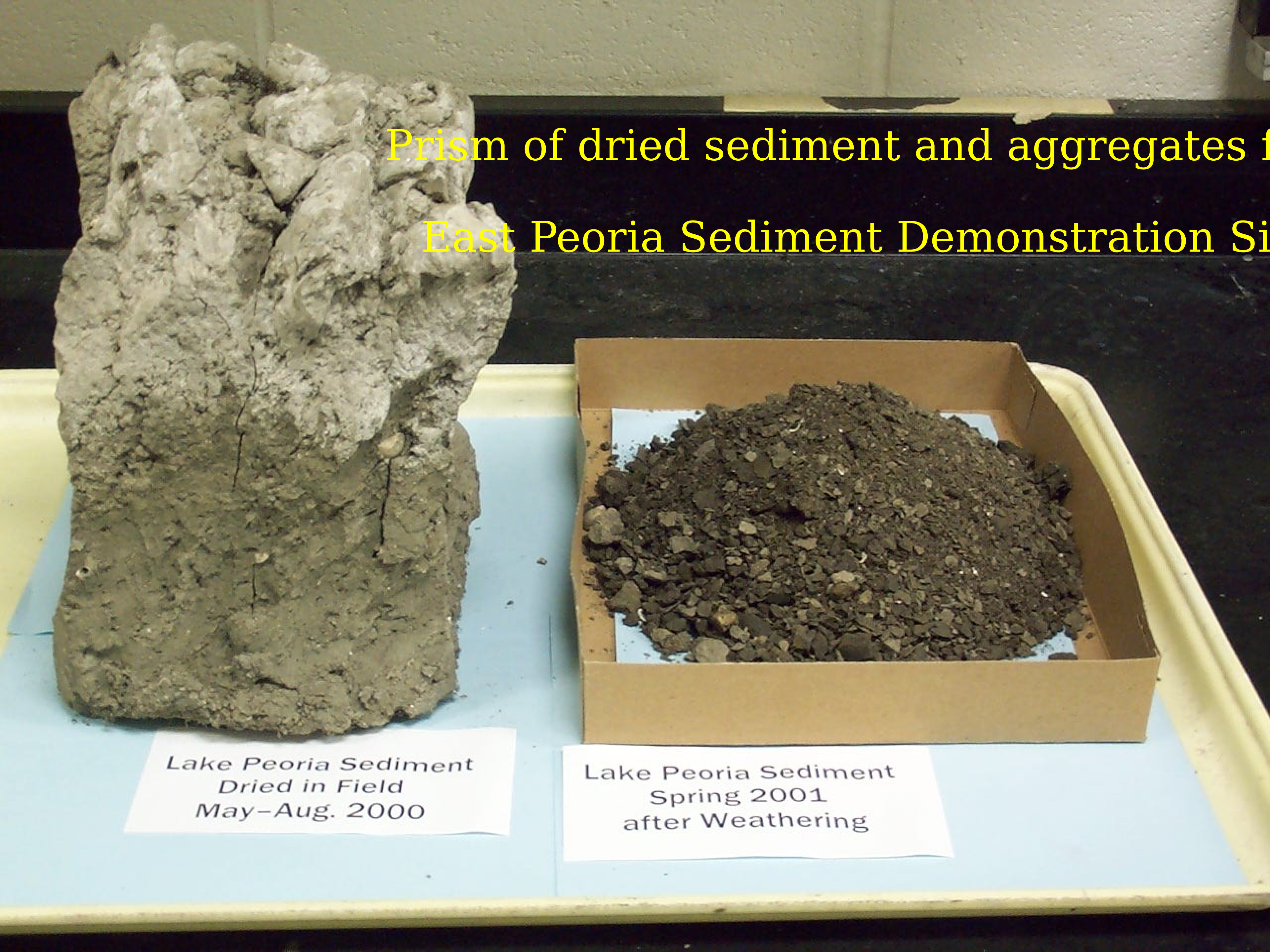


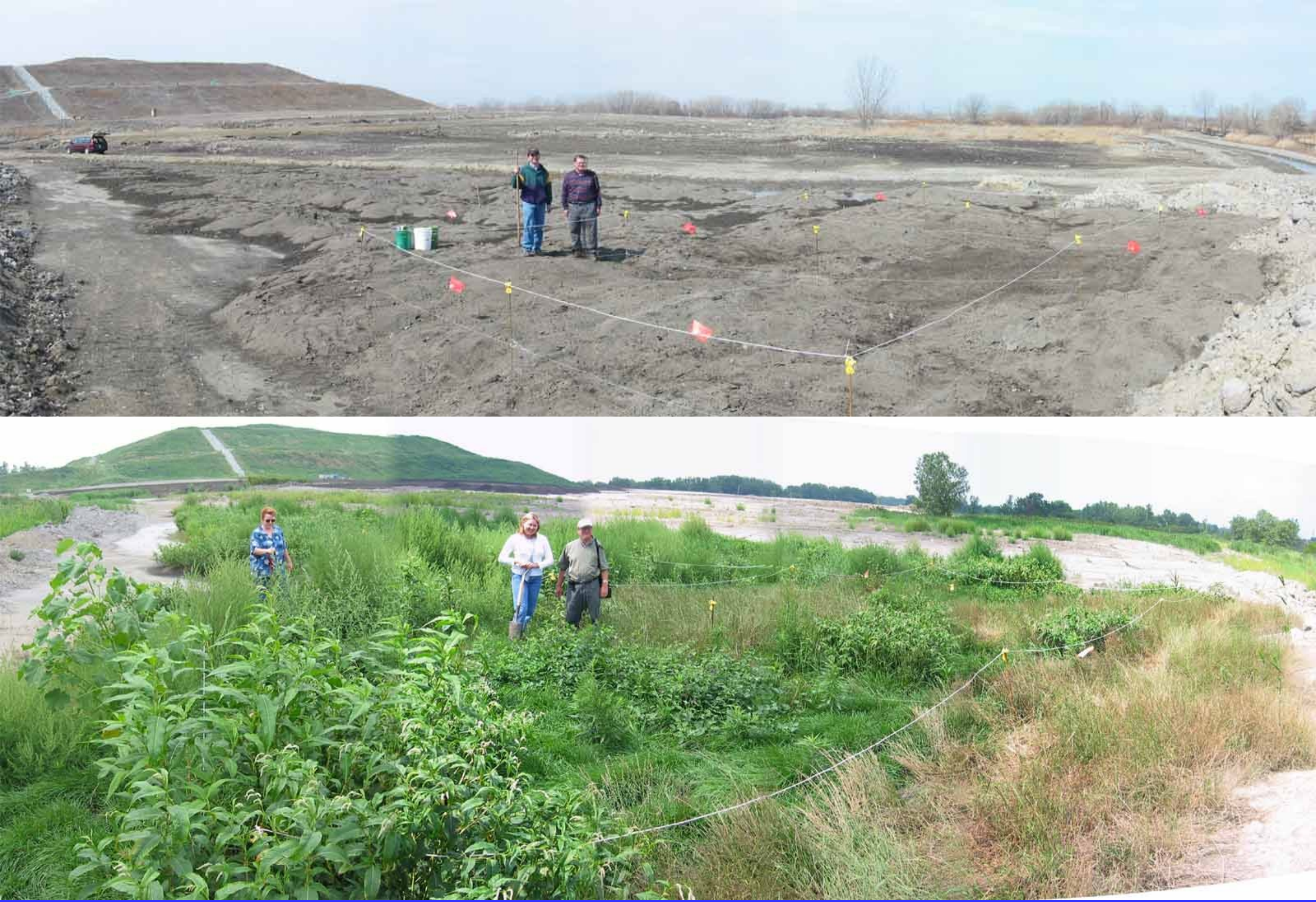
End of experiment



Prism of dried sediment and aggregates f

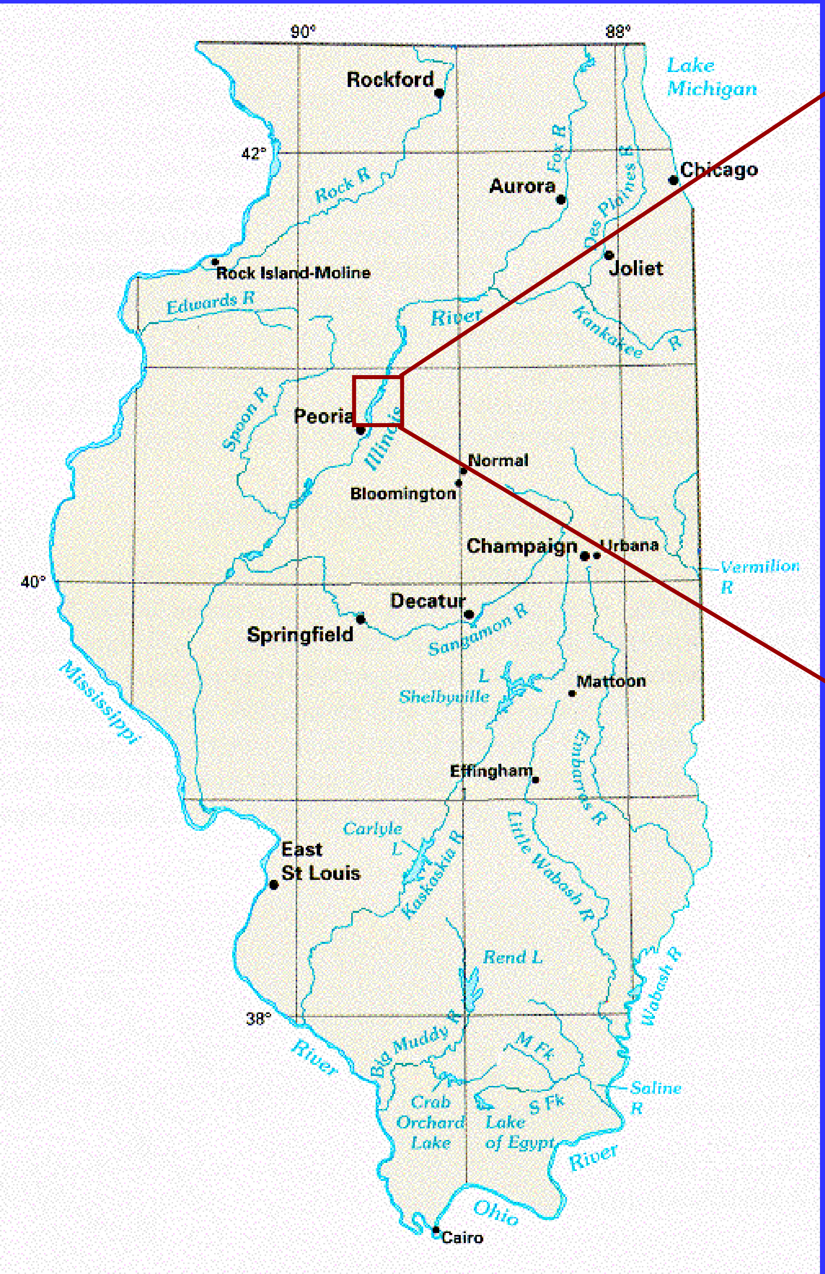
East Peoria Sediment Demonstration Si

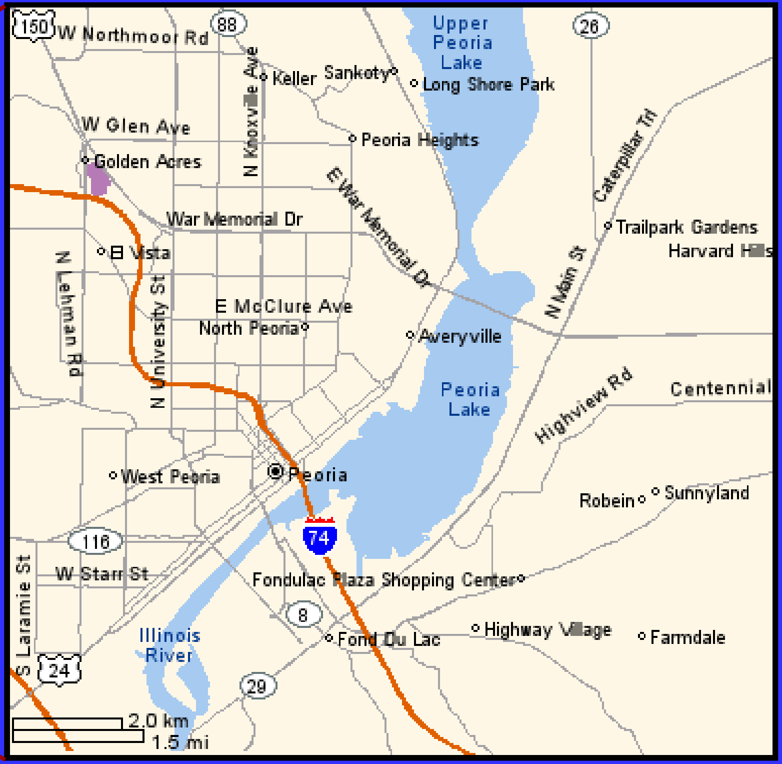

Lake Peoria Sediment
Dried in Field
May–Aug. 2000
Lake Peoria Sediment
Spring 2001
after Weathering



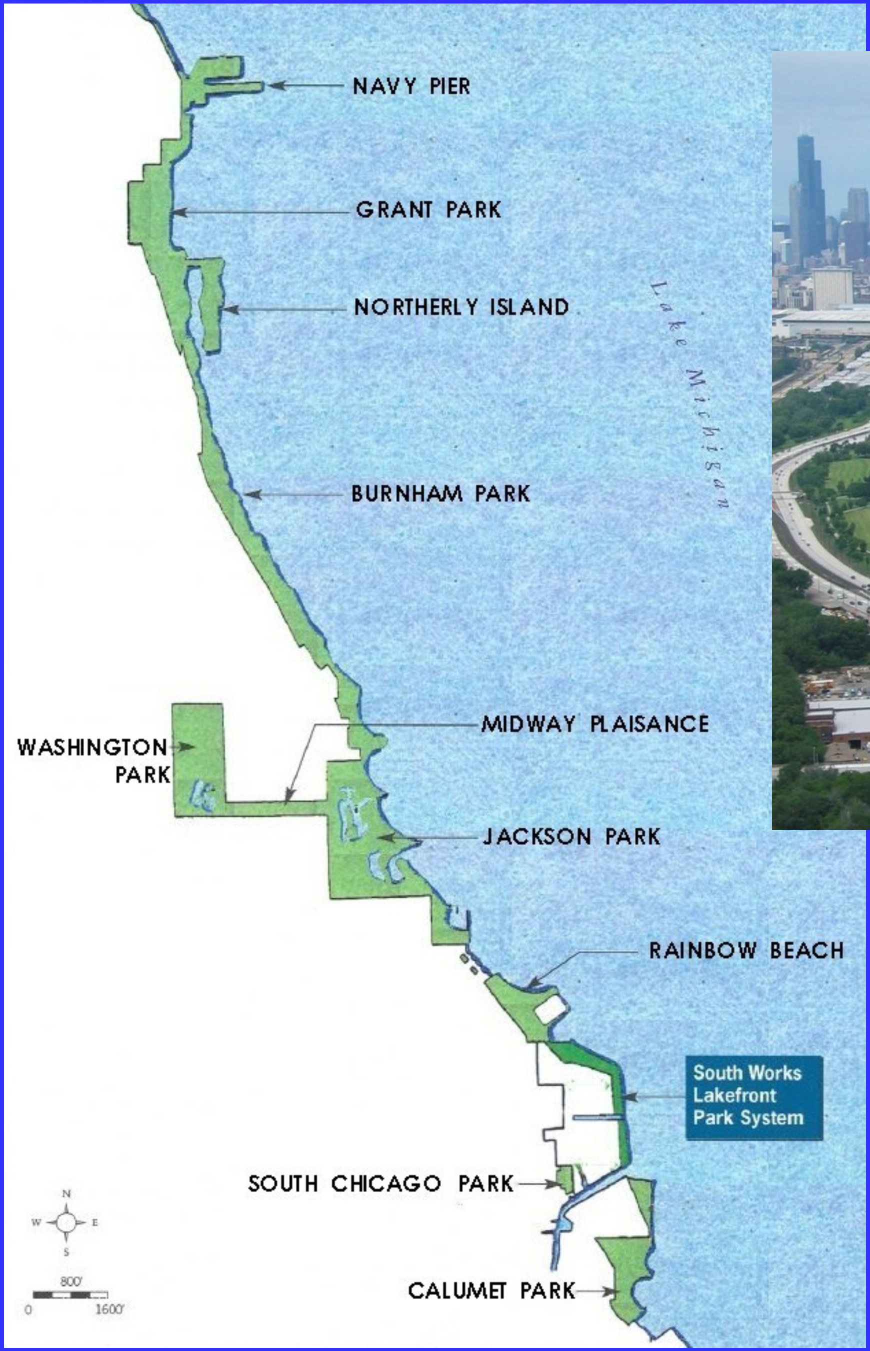
Paxton 1 Sediment Plot Feb. and

Source of Sediment


90°
88°
42°
40°
38°
Lake Michigan
Rockford
Aurora
Chicago
Joliet
Rock R
Fox R
Des Plaines R
Rock Island-Moline
Edwards R
River
Kankakee R
Peoria
Spoon R
Illinois
Normal
Bloomington
Champaign
Urbana
Vermilion R
Decatur
Springfield
Sangamon R
Mattoon
Shelbyville L
Mississippi
Effingham
Embarras R
East St Louis
Carlyle L
Kaskaskia R
Little Wabash R
Wabash R
Rend L
Big Muddy R
M Fk
S Fk
Saline R
River
Crab Orchard Lake
Lake of Egypt
River
Ohio
Cairo

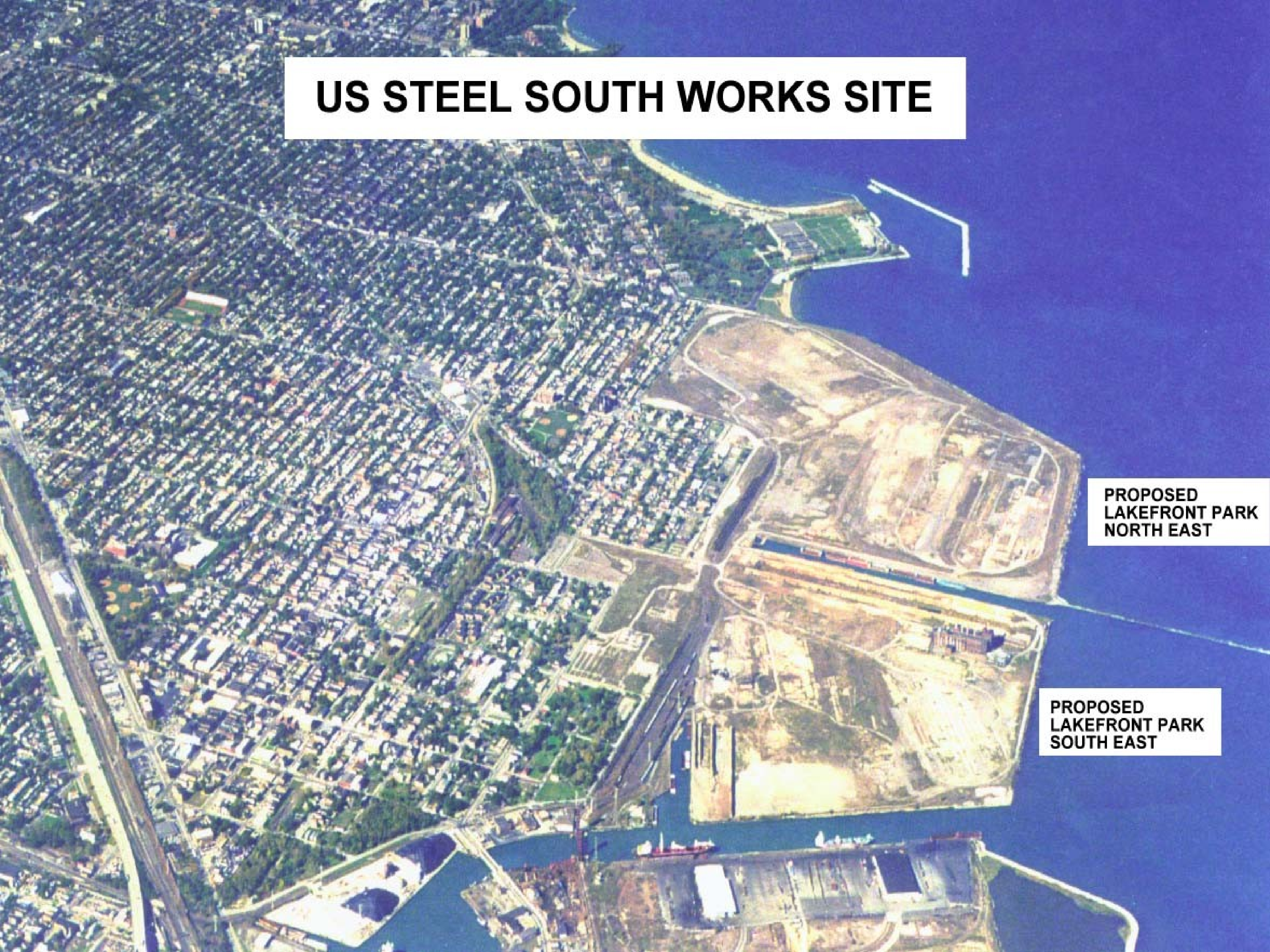

150
W Northmoor Rd
88
N Knoxville Ave
Keller
Sankoty
Upper Peoria Lake
Long Shore Park
26
W Glen Ave
Golden Acres
Peoria Heights
Caterpillar Trl
War Memorial Dr
E War Memorial Dr
Trailpark Gardens
Harvard Hills
Vista
N Lehman Rd
N University St
E McClure Ave
North Peoria
Averyville
N Main St
Peoria Lake
Highview Rd
Centennial
West Peoria
Peoria
Robein
Sunnyland
116
74
W Starr St
Fondulac Plaza Shopping Center
S Laramie St
Illinois River
8
Fond Du Lac
Highway Village
Farmdale
24
29
2.0 km
1.5 mi

Sediments were obtained from the Peoria Lake portion of the Illinois River (River mile 165).


NAVY PIER
GRANT PARK
NORTHERLY ISLAND
Lake Michigan
BURNHAM PARK
MIDWAY PLAISANCE
WASHINGTON PARK
JACKSON PARK
RAINBOW BEACH
South Works Lakefront Park System
SOUTH CHICAGO PARK
CALUMET PARK
N
W
E
S
800'
0
1600'

South lakefront park system

US STEEL SOUTH WORKS SITE

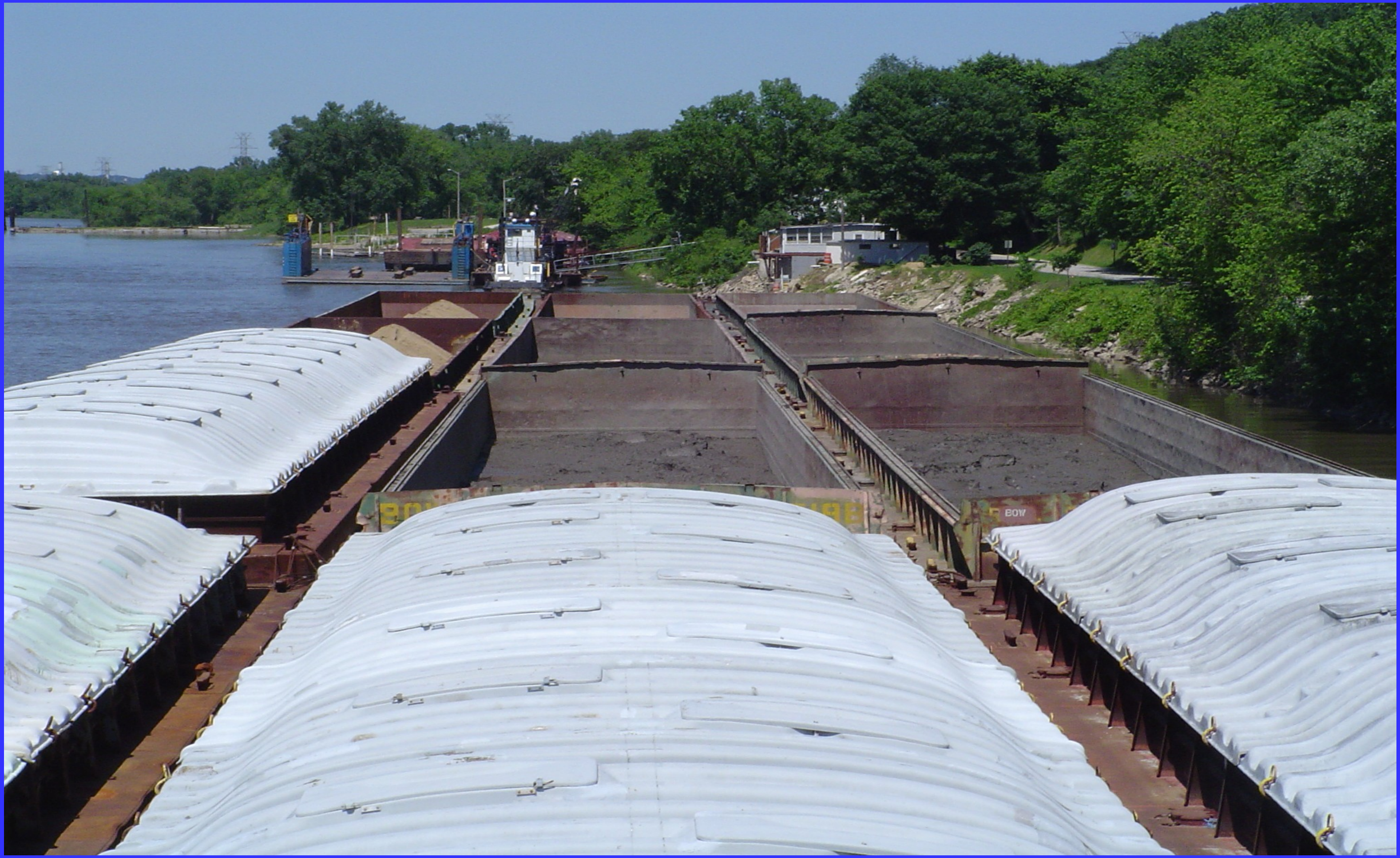


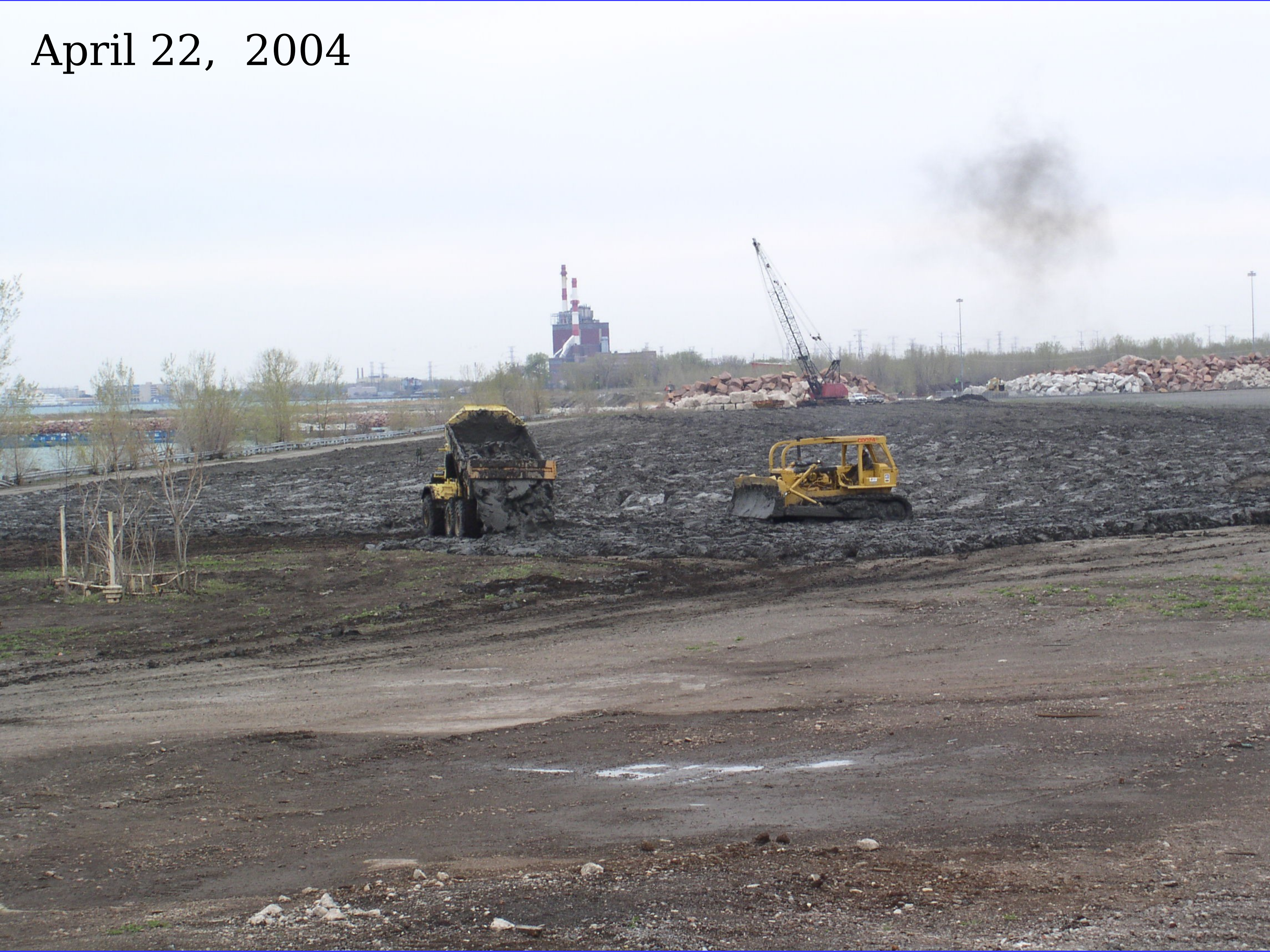
PROPOSED
LAKEFRONT PARK
NORTH EAST

PROPOSED
LAKEFRONT PARK
SOUTH EAST

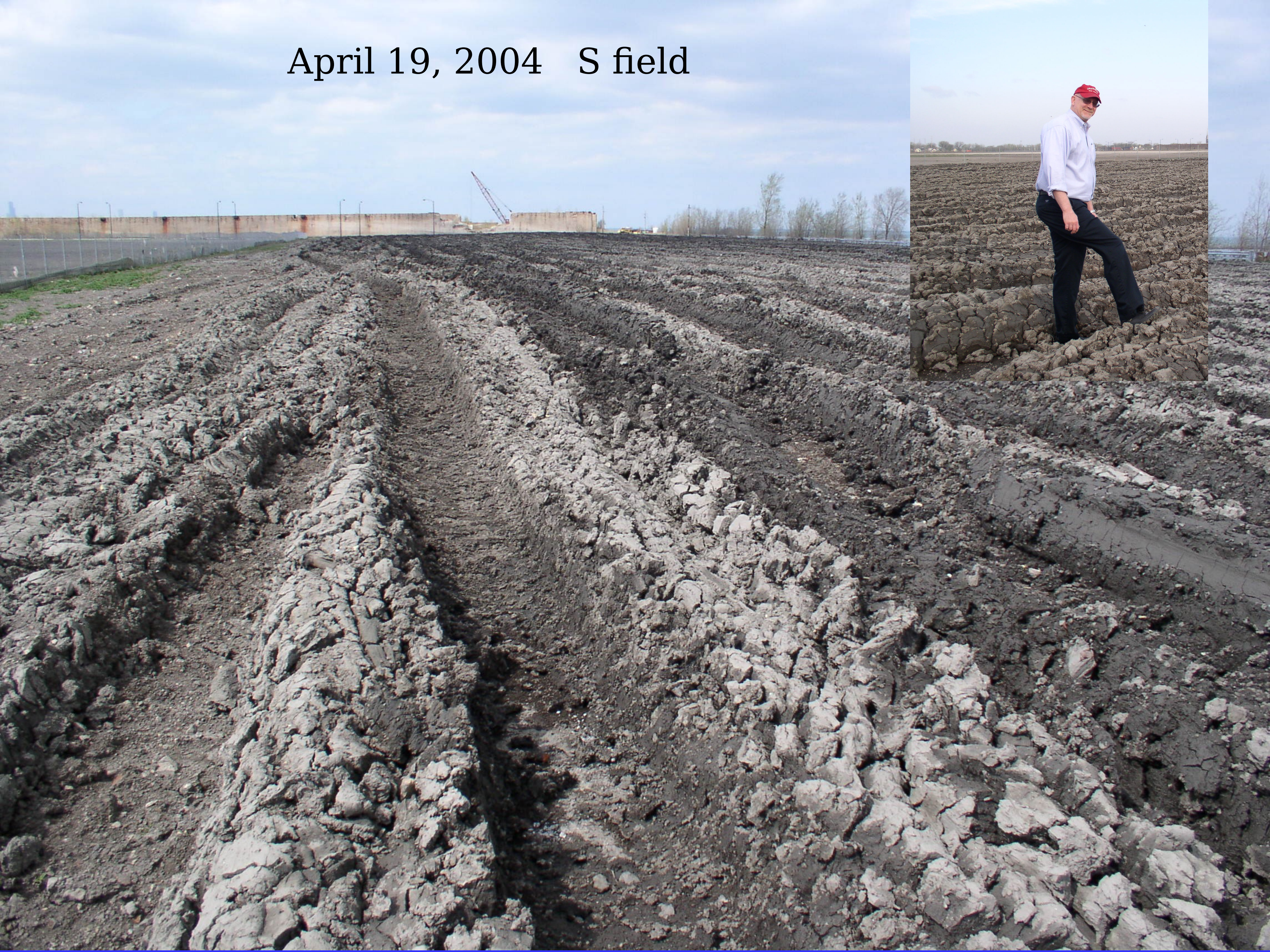
Mud to Parks Process 2004
short

12 Barge tow (salt,sand,mud)

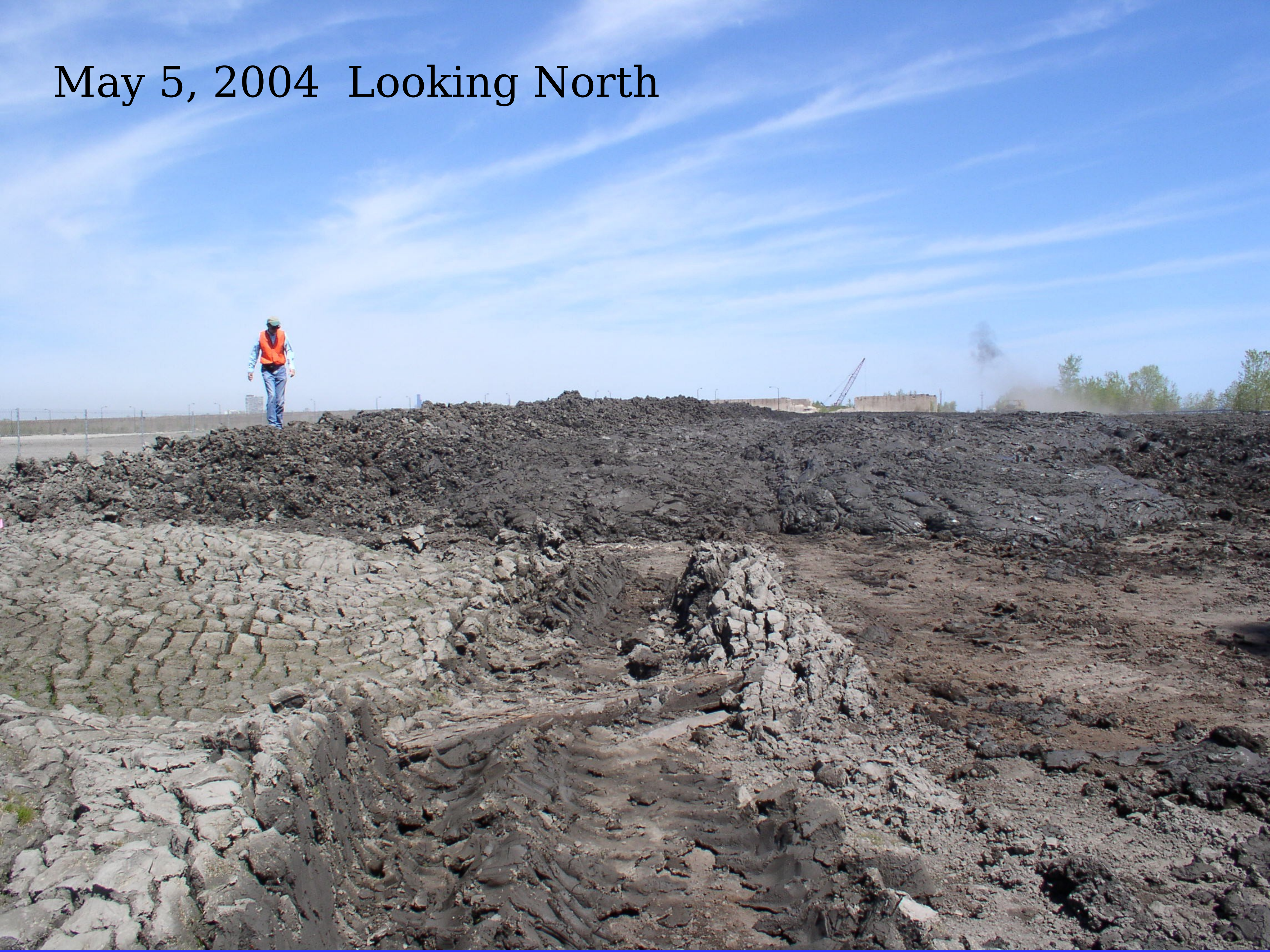




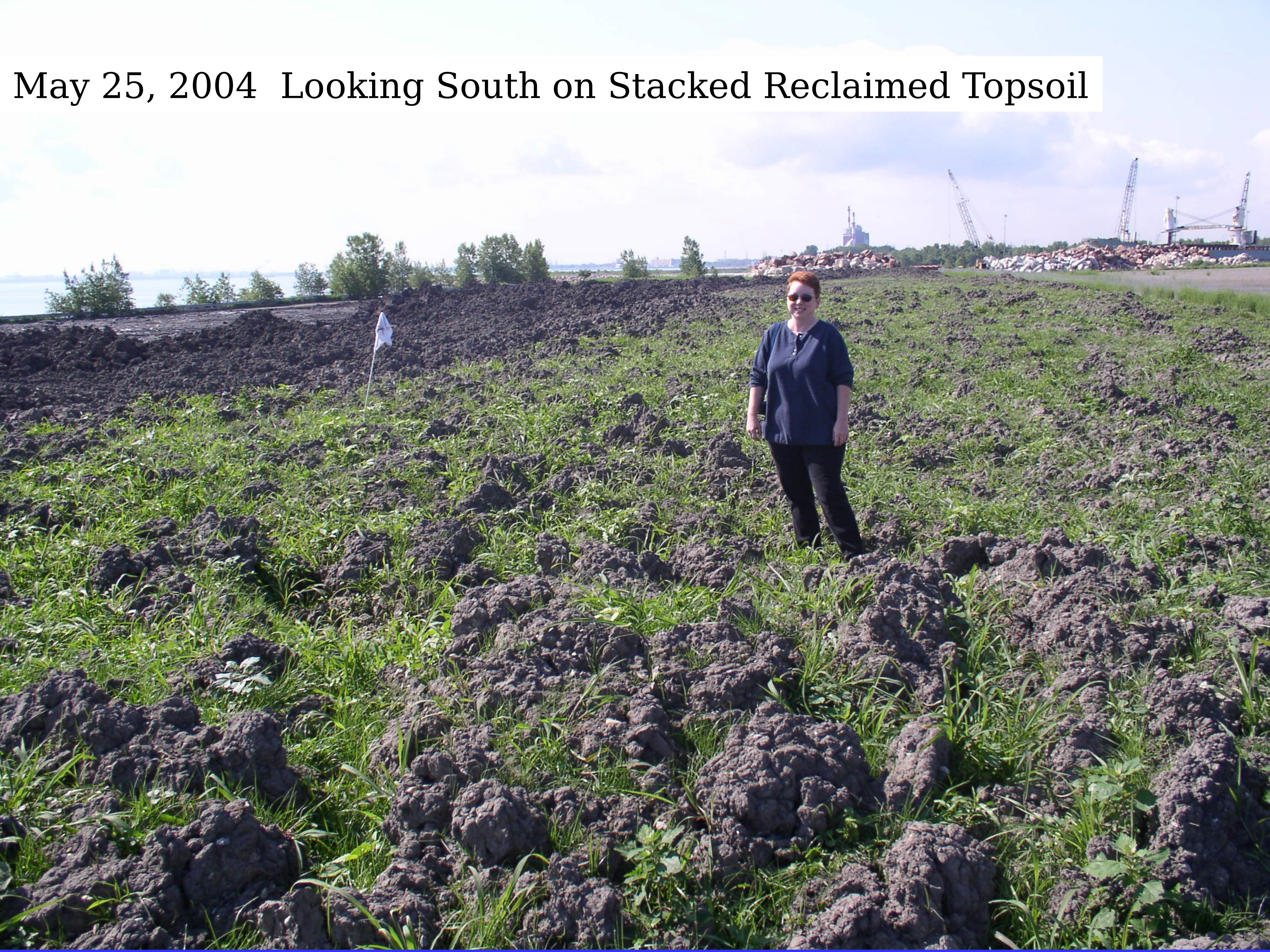
April 22, 2004



April 19, 2004 S field

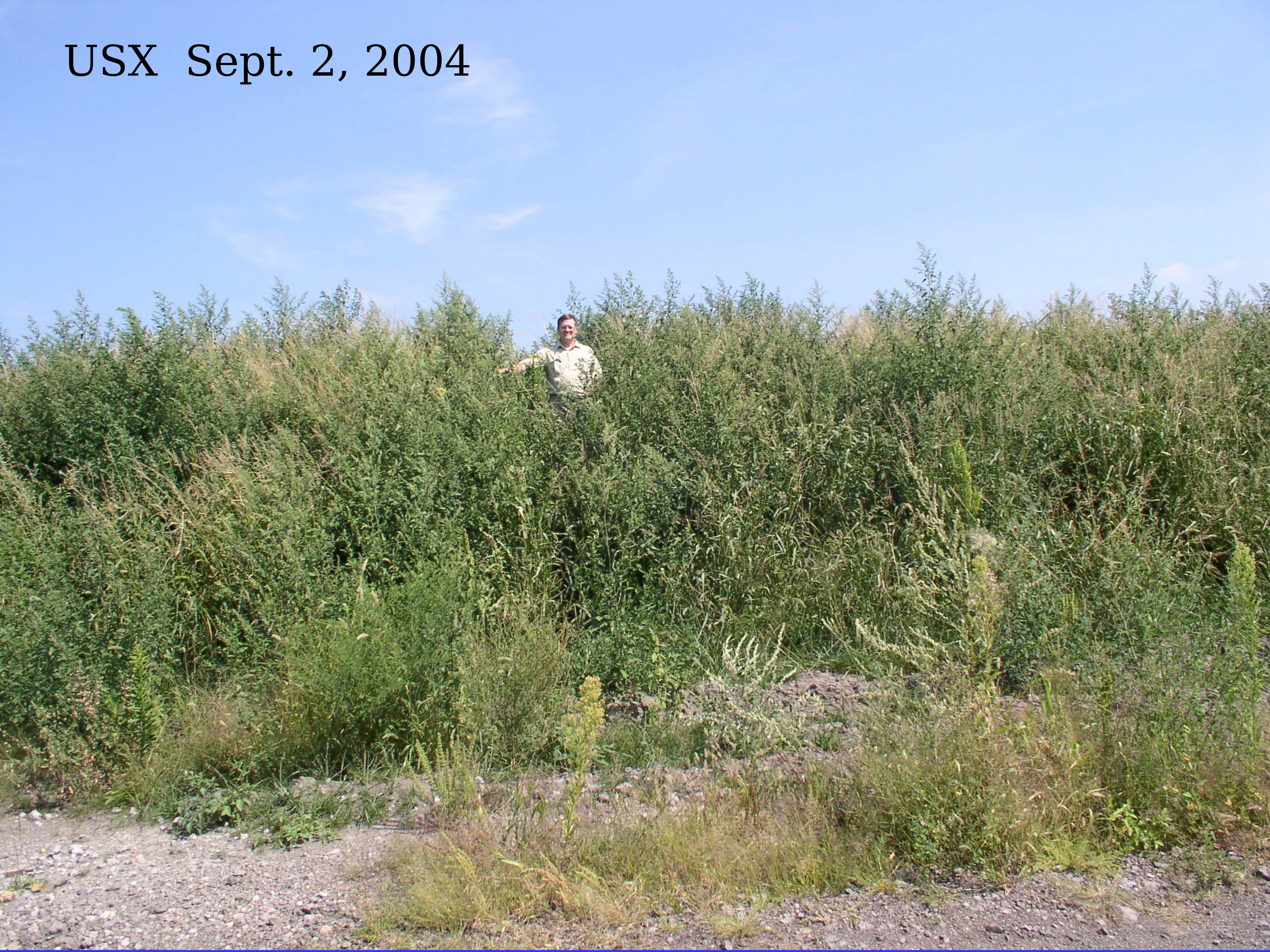


May 5, 2004 Looking North

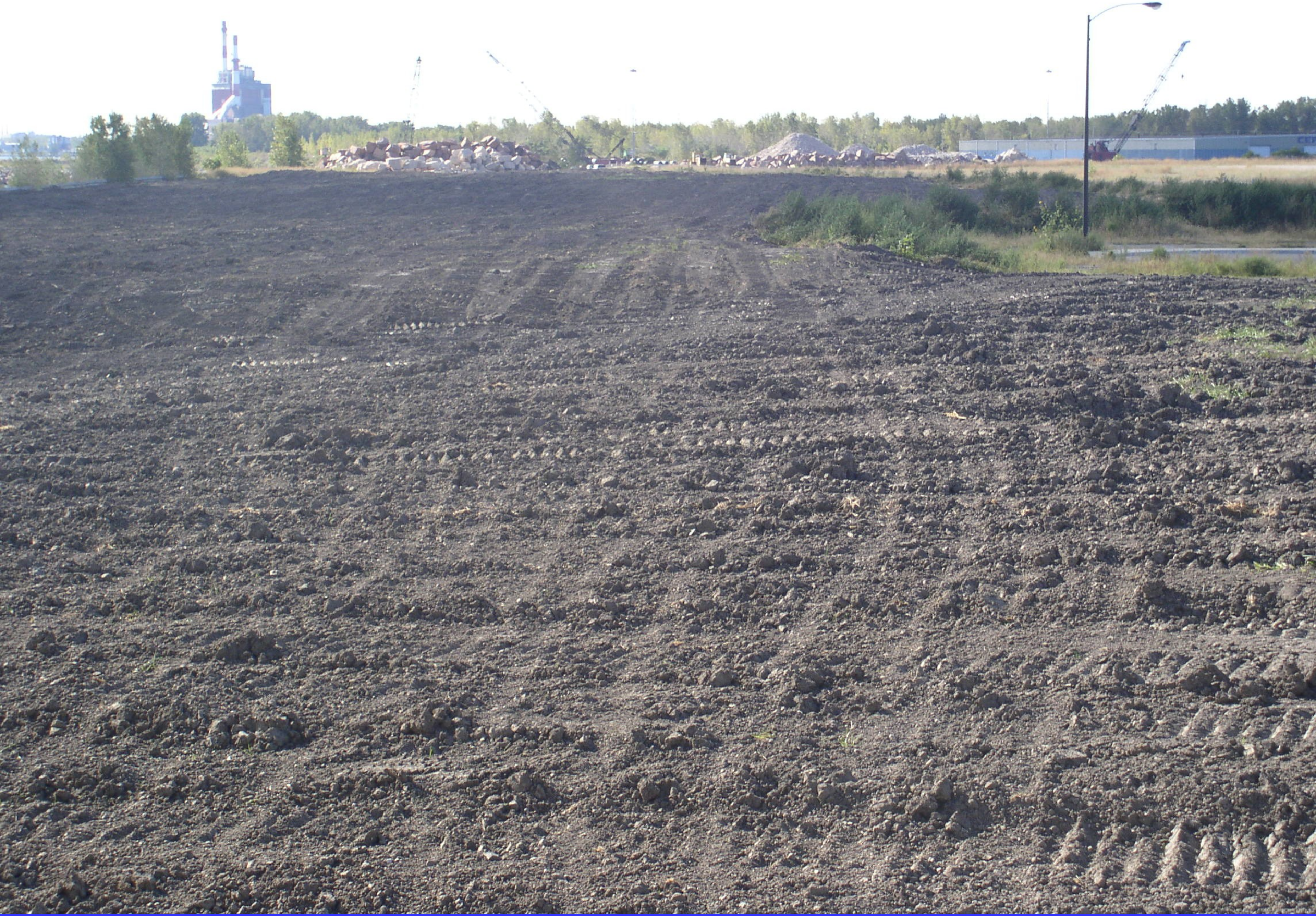


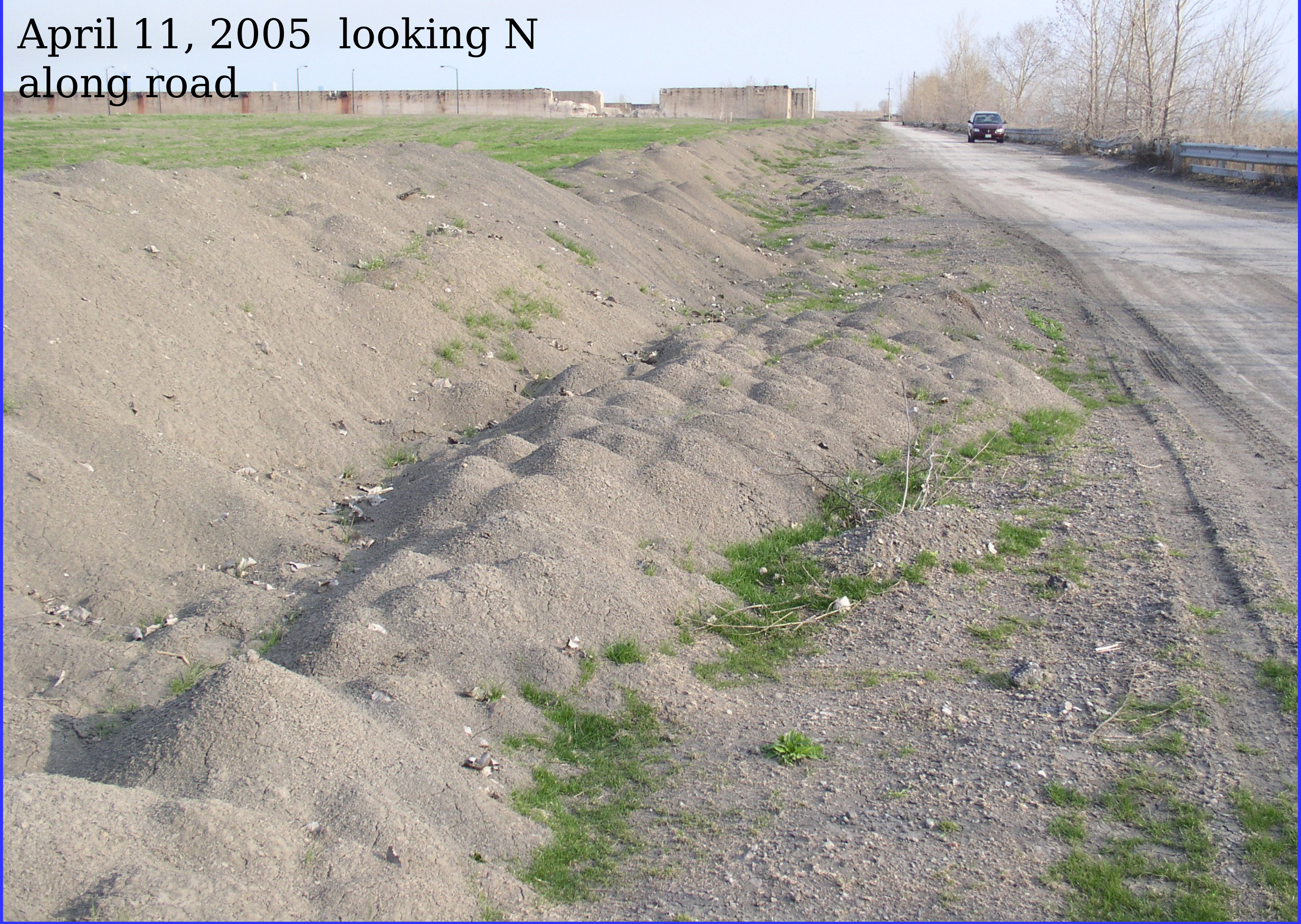
May 25, 2004 Looking South on Stacked Reclaimed Topsoil

USX Sept. 2, 2004



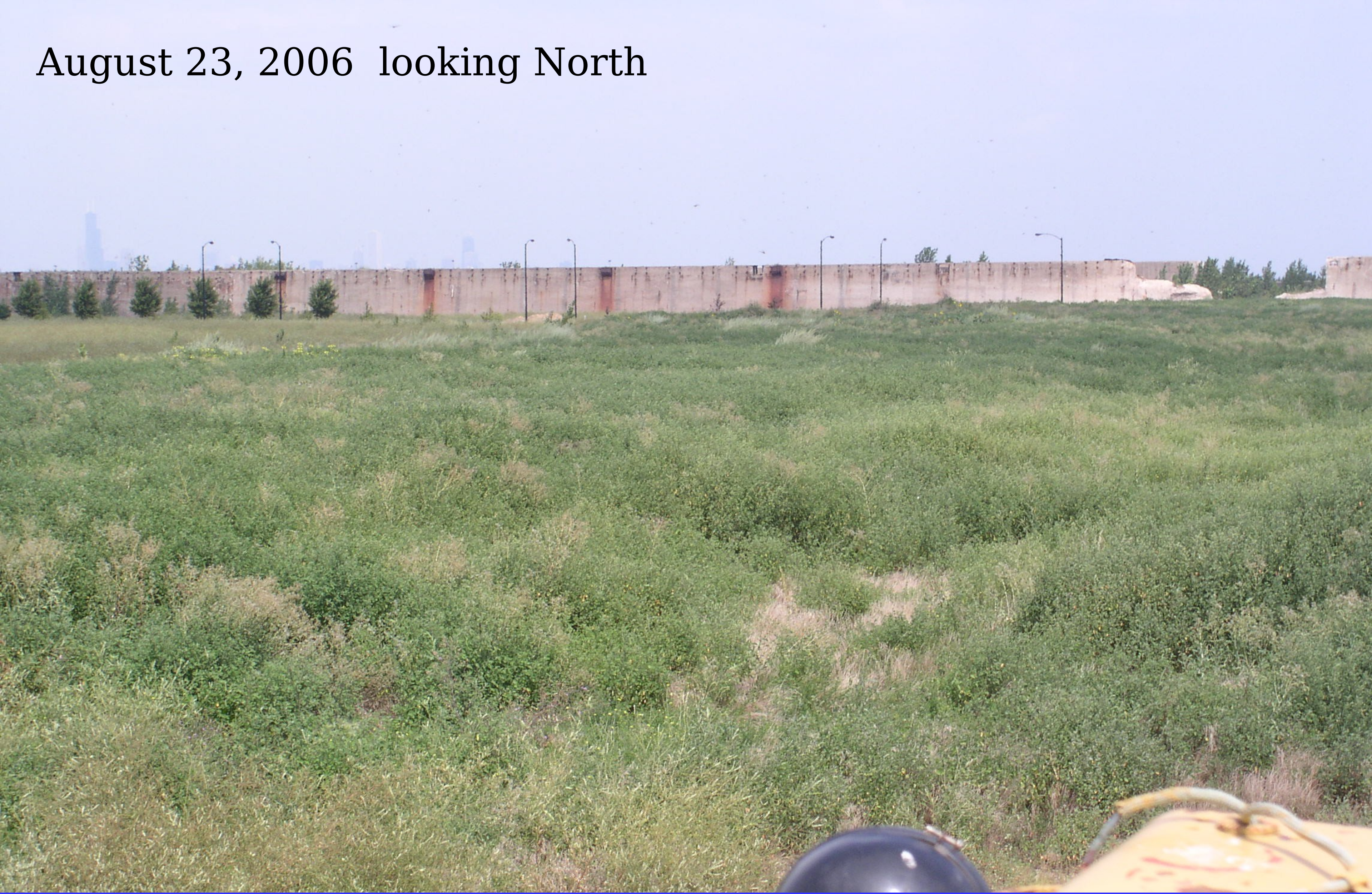
USX Sept. 26, 2004




April 11, 2005 looking N
along road

The first winter’s freezing and thawing accelerated the soil formation process leaving the field covered with granular soil. Lake Michigan is on the right.

Sept. 16, 2005

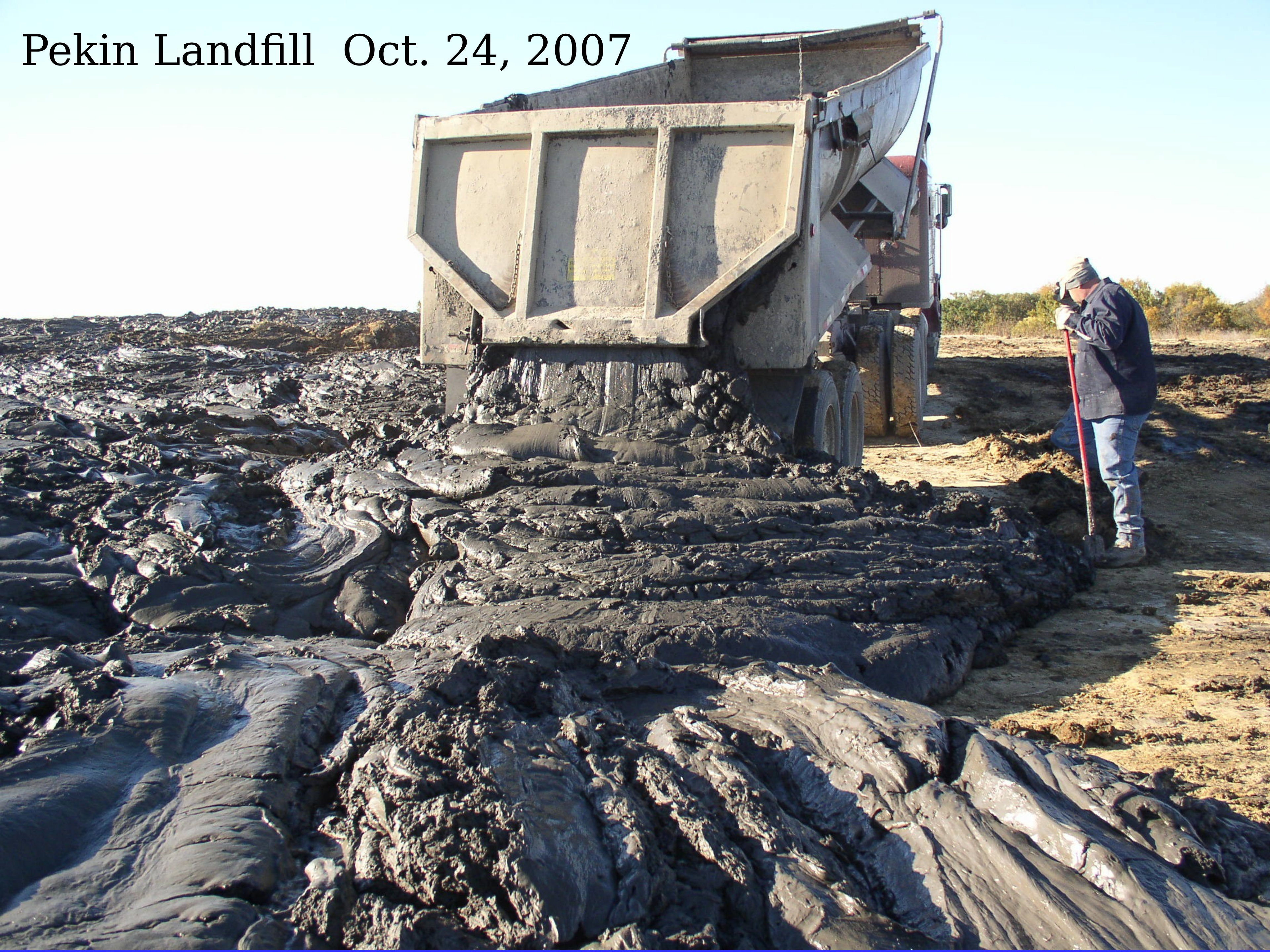


August 23, 2006 looking North

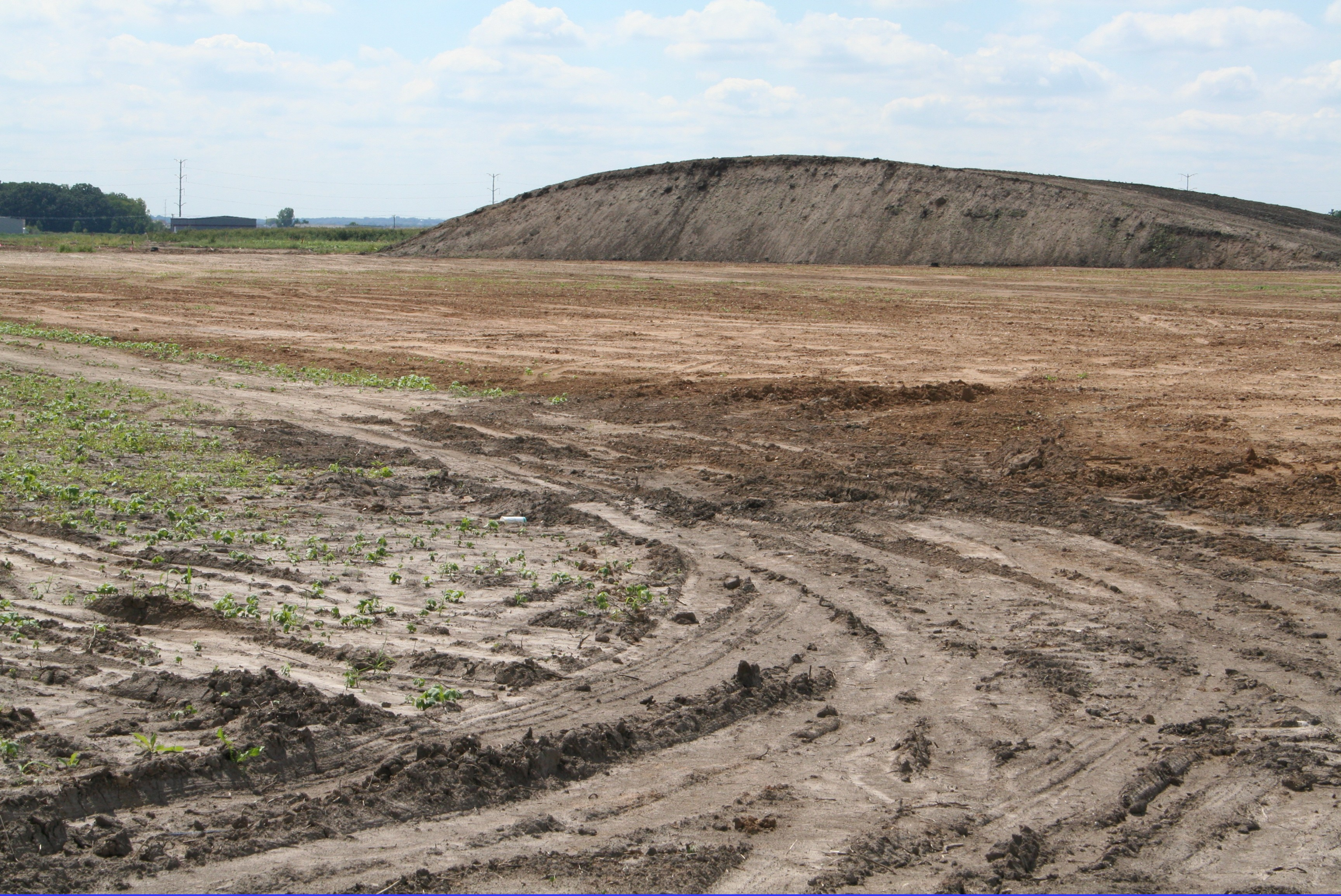
Thick Illinois River sediment can be handled by various types of equipment including:

Trucks and barges
Clam shell and excavator buckets
Concrete and slurry pumps
Conveyors
Conventional hydraulic dredges
etc.

Pekin Landfill Oct. 24, 2007



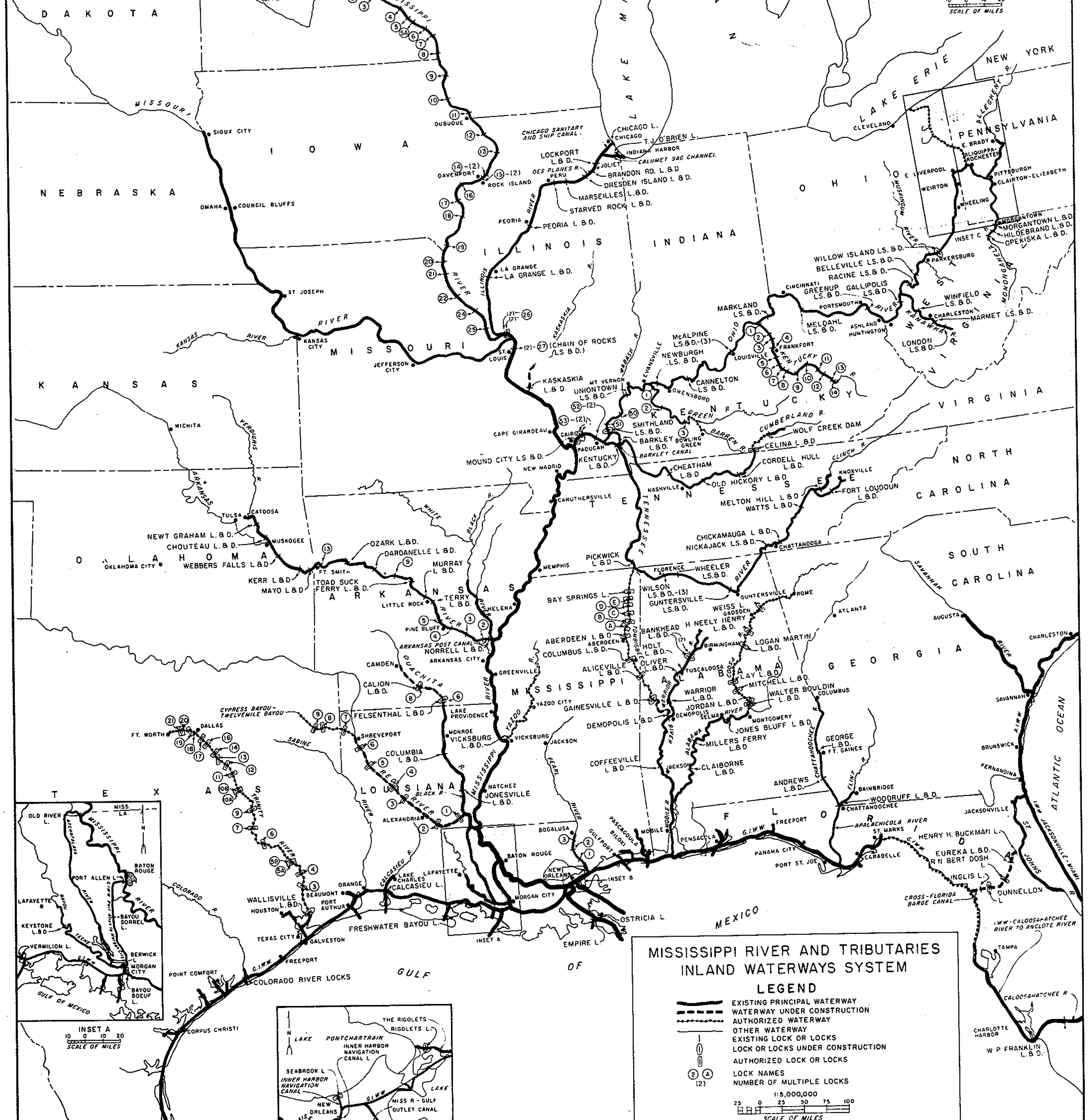
MEYER MATERIAL CO.



Mass grading at construction sites removes topsoil

$500 CU. YD.
TOP SOIL
TOP SOIL
top soil

…that is often given way, thrown away, or sold undermining local sustainability



MISSISSIPPI RIVER AND TRIBUTARIES INLAND WATERWAYS SYSTEM

LEGEND
EXISTING PRINCIPAL WATERWAY
WATERWAY UNDER CONSTRUCTION
AUTHORIZED WATERWAY
OTHER WATERWAY
EXISTING LOCK OR LOCKS
LOCK OR LOCKS UNDER CONSTRUCTION
AUTHORIZED LOCK OR LOCKS
LOCK NAMES
NUMBER OF MULTIPLE LOCKS
1:5,000,000
SCALE OF MILES
DAKOTA
NEBRASKA
IOWA
KANSAS
OKLAHOMA
TEXAS
ARKANSAS
LOUISIANA
MISSISSIPPI
ILLINOIS
INDIANA
OHIO
PENNSYLVANIA
NEW YORK
WEST VIRGINIA
VIRGINIA
KENTUCKY
TENNESSEE
NORTH CAROLINA
SOUTH CAROLINA
GEORGIA
ALABAMA
FLORIDA
LAKE ERIE
LAKE MICHIGAN
GULF OF MEXICO
ATLANTIC OCEAN
MISSOURI RIVER
SIOUX CITY
OMAHA
COUNCIL BLUFFS
ST JOSEPH
KANSAS CITY
JEFFERSON CITY
DUBUQUE
DAVENPORT
ROCK ISLAND
CHICAGO SANITARY AND SHIP CANAL
CHICAGO L.
CHICAGO
T. J. O'BRIEN L.
INDIANA HARBOR
CALUMET SAG CHANNEL
LOCKPORT L. & D.
JOLIET
DES PLAINES R.
BRANDON RD. L. & D.
DRESDEN ISLAND L. & D.
PERU
MARSEILLES L. & D.
STARVED ROCK L. & D.
PEORIA
PEORIA L. & D.
LA GRANGE
LA GRANGE L. & D.
ILLINOIS RIVER
KASKASKIA R.
CHAIN OF ROCKS L. & D.
ST. LOUIS
KASKASKIA L. & D.
CAPE GIRARDEAU
CAIRO
MOUND CITY LS. & D.
NEW MADRID
PADUCAH
KENTUCKY L. & D.
MT VERNON
UNIONTOWN LS. & D.
EVANSVILLE
OWENSBORO
WABASH R.
SMITHLAND LS. & D.
BARKLEY L. & D.
BARKLEY CANAL
GREEN R.
BARREN R.
BOWLING GREEN
CANNELTON LS. & D.
NEWBURGH LS. & D.
McALPINE LS. & D.-(3)
LOUISVILLE
FRANKFORT
KENTUCKY R.
MARKLAND LS. & D.
CINCINNATI
MELDAHL L. & D.
GREENUP L. & D.
GALLIPOLIS L. & D.
PORTSMOUTH
ASHLAND
HUNTINGTON
RACINE L. & D.
BELLEVILLE LS. & D.
WILLOW ISLAND LS. & D.
PARKERSBURG
WINFIELD L. & D.
CHARLESTON
MARMET L. & D.
LONDON L. & D.
KANAWHA R.
MUSKINGUM R.
WHEELING
WEIRTON
E. LIVERPOOL
PITTSBURGH
CLAIRTON-ELIZABETH
ALIQUIPPA-ROCHESTER
E. BRADY
ALLEGHENY R.
CLEVELAND
MORGANTOWN
MORGANTOWN L. & D.
HILDEBRAND L. & D.
OPEKISKA L. & D.
MONONGAHELA R.
INSET C
CUMBERLAND R.
WOLF CREEK DAM
CELINA L. & D.
CORDELL HULL L. & D.
CHEATHAM L. & D.
NASHVILLE
OLD HICKORY L. & D.
CLINCH R.
KNOXVILLE
FORT LOUDOUN L. & D.
MELTON HILL L. & D.
WATTS L. & D.
CHICKAMAUGA L. & D.
NICKAJACK LS. & D.
CHATTANOOGA
TENNESSEE R.
PICKWICK L. & D.
FLORENCE
WHEELER L. & D.
WILSON LS. & D.-(3)
GUNTERSVILLE L. & D.
CARUTHERSVILLE
MEMPHIS
WICHITA
ARKANSAS R.
VERDIGRIS R.
TULSA
CATOOSA
NEWT GRAHAM L. & D.
CHOUTEAU L. & D.
MUSKOGEE
WEBBERS FALLS L. & D.
OKLAHOMA CITY
KERR L. & D.
MAYO L. & D.
FT. SMITH
TOAD SUCK FERRY L. & D.
OZARK L. & D.
DARDANELLE L. & D.
MURRAY L. & D.
LITTLE ROCK
TERRY L. & D.
PINE BLUFF
ARKANSAS POST CANAL
NORRELL L. & D.
ARKANSAS CITY
WHITE R.
BLACK R.
HELENA
CAMDEN
OUACHITA R.
CALION L. & D.
FELSENTHAL L. & D.
LAKE PROVIDENCE
MONROE
VICKSBURG L. & D.
VICKSBURG
YAZOO R.
YAZOO CITY
GREENVILLE
NATCHEZ
JONESVILLE L. & D.
BLACK R.
RED RIVER
ALEXANDRIA
SHREVEPORT
COLUMBIA L. & D.
CYPRESS BAYOU-TWELVEMILE BAYOU
SABINE R.
FT. WORTH
DALLAS
TRINITY RIVER
WALLISVILLE L. & D.
HOUSTON
BEAUMONT
ORANGE
PORT ARTHUR
CALCASIEU R.
LAKE CHARLES
CALCASIEU L.
LAFAYETTE
FRESHWATER BAYOU L.
TEXAS CITY
GALVESTON
FREEPORT
COLORADO R.
POINT COMFORT
COLORADO RIVER LOCKS
CORPUS CHRISTI
G.I.W.W.
BATON ROUGE
NEW ORLEANS
MORGAN CITY
INSET A
INSET B
EMPIRE L.
OSTRICIA L.
BOGALUSA
PEARL RIVER
JACKSON
GULFPORT
BILOXI
PASCAGOULA R.
MOBILE
MOBILE R.
BAY SPRINGS L.
ABERDEEN L. & D.
ABERDEEN
COLUMBUS L. & D.
TOMBIGBEE R.
ALICEVILLE L. & D.
GAINESVILLE L. & D.
DEMOPOLIS L. & D.
DEMOPOLIS
COFFEEVILLE L. & D.
JACKSON
CLAIBORNE L. & D.
MILLERS FERRY L. & D.
ALABAMA RIVER
SELMA
JONES BLUFF L. & D.
MONTGOMERY
BANKHEAD L. & D.
HOLT L. & D.
OLIVER L. & D.
TUSCALOOSA
WARRIOR R.
WARRIOR L. & D.
BIRMINGHAM
H NEELY HENRY L. & D.
WEISS L.
GADSDEN
GUNTERSVILLE
ROME
COOSA R.
LOGAN MARTIN L. & D.
LAY L. & D.
MITCHELL L. & D.
JORDAN L. & D.
WALTER BOULDIN L. & D.
COLUMBUS
ATLANTA
GEORGE L. & D.
FT. GAINES
CHATTAHOOCHEE R.
ANDREWS L. & D.
FLINT R.
BAINBRIDGE
WOODRUFF L. & D.
CHATTAHOOCHEE
APALACHICOLA RIVER
PENSACOLA
PANAMA CITY
PORT ST. JOE
CARABELLE
ST. MARKS
HENRY H. BUCKMAN L.
EUREKA L. & D.
R N BERT DOSH L.
INGLIS L.
DUNNELLON L.
CROSS-FLORIDA BARGE CANAL
IWW-CALOOSAHATCHEE RIVER TO ANCLOTE RIVER
TAMPA
CALOOSAHATCHEE R.
CHARLOTTE HARBOR
W P FRANKLIN L. & D.
JACKSONVILLE
FERNANDINA
BRUNSWICK
SAVANNAH
AUGUSTA
SAVANNAH RIVER
CHARLESTON
ST. JOHNS R.
IWW JACKSONVILLE-MIAMI
A.I.W.W.
OLD RIVER L.
ATCHAFALAYA R.
MISS. LA.
PORT ALLEN L.
BAYOU SORREL L.
KEYSTONE L. & D.
VERMILION L.
BERWICK L.
BAYOU BOEUF L.
TECHE
INSET A
SCALE OF MILES
THE RIGOLETS
RIGOLETS L.
LAKE PONTCHARTRAIN
INNER HARBOR NAVIGATION CANAL L.
SEABROOK L.
MISS R - GULF OUTLET CANAL
NEW ORLEANS

Which legislative, administrative or regulatory authorities and interpretations need revision to allow:

cooperation across jurisdictions and agencies

consideration of long term sustainability and other benefits along with least cost considerations http://www.wmrc.uiuc.edu/special_projects/il_river/

and

http://ilrdss.sws.uiuc.edu/

Over the years many collaborators assisted with elements of the sediment project that lead to Mud to Parks including but not limited to :

The Illinois State Water Survey; Illinois Geological Survey; The University of Illinois, Illinois Natural History Survey; Rock Island District, USACE, ARTCO Fleeting; Midwest Foundation; Caterpillar Inc; Kress Corp; Chicago Park District; Fon Du Lak Park District; Finch Trucking, numerous other private and government